Chapter 1 : Principles of Physical Optics: Charles A. Bennett: blog.quintoapp.com: Books

Very useful book for learning basics of various physical optics topics. It goes just deep enough to cover a wide range of topics is a relatively small book, from electro-magnetism to lenses to thin films.

Under such conditions, electromagnetic fields and waves start to behave more like optical fields and waves. Asymptotic methods are typically inspired by optical analysis. In the Physical Optics PO method, a scatterer surface is illuminated by an incident source, and it is modeled by equivalent electric and magnetic surface currents. This concept is based on the fundamental equivalence theorem of electromagnetics. According to the Huygens principle, the equivalent electric and magnetic surface currents are derived from the tangential components of magnetic and electric fields on a given closed surface, respectively. A simple PO analysis involves only perfect electric conductors, and only electric surface currents related to the tangential magnetic fields are considered. Illumina assumes that a source like a short dipole radiator or an incident plane wave induces currents on the surface of the metallic structure. These induced currents, in turn, reradiate into the free space and produce the scattered fields. In the case of an impedance surface, both surface electric and magnetic currents are induced on the surface of the scatterer. A challenging step in establishing the PO currents is the determination of the lit and shadow points on complex scatterer geometries. The conventional physical optics method GO-PO uses geometrical optics ray tracing from each source to the points on the scatterers to determine whether they fall into the lit or shadow regions. But this can become a time consuming task as the size of the computational problem grows. The general impedance boundary condition relates the tangential components of the electric and magnetic fields on the surface: To treat an object with an arbitrary geometry using PO, the object is first decomposed into many small elementary patches or cells, which have a simple geometry such as a rectangle or triangle. Then, using the tangent plane approximation, the equivalent electric and magnetic surface currents, J r and M r , on the lit region of the scatterer are approximated by: These reflection coefficients are given by: Two special limiting cases of an impedance surface are perfect electric conductor PEC and perfect magnetic conductor PMC surface. Determination of lit and shadowed regions for simple, stand-alone, convex objects is rather simple. Denoting the incidence direction from a source to a point on the scatterer by the unit vector k, the point is considered lit if n. These conditions, however, are only valid if there is a direct line of sight LOS between the source and the centroid of the cell under consideration. They cannot predict if there are any obstructing objects in the path of the incident beam or ray. For simple convex objects, a Geometrical Optics GO approach can be used to finds the optical LOS lines and determine the lit and shadowed areas on the object. The conventional PO can then be used to find the electric and magnetic surface currents. These secondary fields are the scattered fields that are superposed with the primary incident fields. The near fields at every point r in space are calculated from: Illumina , the background structure is the free space. The current on the lit region produces a scattered field in the forward direction that is almost equal and out of phase with the incident wave. Hence, the sum of the scattered field and incident field over the shadowed region almost cancel each other, giving rise to a very small field there. This suggests that keeping track of multiple scattering can take care of shadowing problems automatically. In addition, the effects of multiple scattering can be readily accounted for by an iterative PO approach to be formulated next. However, this approximation does not formally recognize the lit and shadowed areas. Instead of identifying the exact boundaries of the lit and shadowed areas over a complex target, a simple condition is used first to find the primary shadowed areas. Then, through PO iterations all shadowed areas are determined automatically. When calculating the field on the scatterer for every source point, a primary shadowing condition given by n. In complex scatterer geometries, there are shadowed points in concave regions where n. Therefore, in computation of the above equations, only the contribution of the points that satisfy the following condition are considered: The iterative solution will not only account for double-bounce scattering over the lit regions but it also removes the lower order currents erroneously placed over concave shadowed areas. General Huygens Sources According to the electromagnetic equivalence theorem, if we know the tangential components of E and H fields on a closed surface, we can determine all the E and H fields inside and outside that surface in a unique way. Such a surface is called a Huygens surface. At the end of a full-wave FDTD or MoM solution, all the electric and magnetic fields are known everywhere in the computational domain. We can therefore define a box around the radiating source structure, over which we can record the tangential E and H field components. The tangential field components are then used to define equivalent electric and magnetic surface currents over the Huygens surface as: Cube Huygens surfaces are cubic and are discretized using a rectangular mesh. Note that the calculated near-zone electric and magnetic fields act as incident fields for the scatterers in your EM. The Huygens source data are normally generated in one of EM. Keep in mind that the fields scattered or reradiated by your physical structure do not affect the fields inside the Huygens source. The far fields of the Huygens surface currents are calculated from the following relations:

DOWNLOAD PDF PRINCIPLES OF PHYSICAL OPTICS

Chapter 2 : [PDF/ePub Download] principles of physical optics eBook

Principles of Physical Optics offers modern topic coverage, emphasis and pedagogy. This course will prove to be attractive to physics majors, and provide students with expertise valued in industry. This course will prove to be attractive to physics majors, and provide students with expertise valued in industry.

Timeline of electromagnetism and classical optics The Nimrud lens Optics began with the development of lenses by the ancient Egyptians and Mesopotamians. These practical developments were followed by the development of theories of light and vision by ancient Greek and Indian philosophers, and the development of geometrical optics in the Greco-Roman world. With many propagators including Democritus , Epicurus , Aristotle and their followers, this theory seems to have some contact with modern theories of what vision really is, but it remained only speculation lacking any experimental foundation. Plato first articulated the emission theory, the idea that visual perception is accomplished by rays emitted by the eyes. He also commented on the parity reversal of mirrors in Timaeus. He summarised much of Euclid and went on to describe a way to measure the angle of refraction , though he failed to notice the empirical relationship between it and the angle of incidence. During the Middle Ages , Greek ideas about optics were resurrected and extended by writers in the Muslim world. One of the earliest of these was Al-Kindi c. In the early 11th century, Alhazen Ibn al-Haytham wrote the Book of Optics Kitab al-manazir in which he explored reflection and refraction and proposed a new system for explaining vision and light based on observation and experiment. Bacon was able to use parts of glass spheres as magnifying glasses to demonstrate that light reflects from objects rather than being released from them. The first wearable eyeglasses were invented in Italy around He was also able to correctly deduce the role of the retina as the actual organ that recorded images, finally being able to scientifically quantify the effects of different types of lenses that spectacle makers had been observing over the previous years. In , Christiaan Huygens proposed a wave theory for light based on suggestions that had been made by Robert Hooke in In , Newton published Opticks and, at the time, partly because of his success in other areas of physics , he was generally considered to be the victor in the debate over the nature of light. This work led to a theory of diffraction for light and opened an entire area of study in physical optics. The ultimate culmination, the theory of quantum electrodynamics , explains all optics and electromagnetic processes in general as the result of the exchange of real and virtual photons. Glauber , and Leonard Mandel applied quantum theory to the electromagnetic field in the s and s to gain a more detailed understanding of photodetection and the statistics of light. Classical optics[edit] Classical optics is divided into two main branches: In geometrical optics, light is considered to travel in straight lines, while in physical optics, light is considered as an electromagnetic wave. Geometrical optics can be viewed as an approximation of physical optics that applies when the wavelength of the light used is much smaller than the size of the optical elements in the system being modelled. Geometrical optics Geometry of reflection and refraction of light rays Geometrical optics, or ray optics, describes the propagation of light in terms of "rays" which travel in straight lines, and whose paths are governed by the laws of reflection and refraction at interfaces between different media. They can be summarised as follows: When a ray of light hits the boundary between two transparent materials, it is divided into a reflected and a refracted ray. The law of reflection says that the reflected ray lies in the plane of incidence, and the angle of reflection equals the angle of incidence. The law of refraction says that the refracted ray lies in the plane of incidence, and the sine of the angle of refraction divided by the sine of the angle of incidence is a constant:

Chapter 3 : blog.quintoapp.com: Customer reviews: Principles of Physical Optics

Physical Optics as an Asymptotic Technique. Asymptotic methods are usually valid at high frequencies as k 0 R = 2Ï€ R/Î» 0 >> 1, where R is the distance between the source and observation points, k 0 is the free-space propagation constant and Î» 0 is the free-space wavelength.

DOWNLOAD PDF PRINCIPLES OF PHYSICAL OPTICS

Chapter 4 : Optics - Wikipedia

Breathing a breath of fresh air into the field of optics, Principles of Physical Optics is the first new entry in the field in the last 20 years. It provides readers with a completely modern approach to the subject, covering a wide range of topics. This includes detailed discussions on geometric.

Chapter 5 : principles of physical optics | Download eBook pdf, epub, tuebl, mobi

The data of physical optics exhibit certain general and permanent characteristic properties, gradually elucidated during the historical development of optics, which correlate the data and draw attention to their points of similarity. We shall now give a resume of these properties.

Chapter 6 : Basic Principles of Physical Optics - Emagtech Wiki

Breathing a breath of fresh air into the field of optics, Principles of Physical Optics is the first new entry in the field in the last 20 years. It provides readers with a completely modern approach to the subject, covering a wide range of topics.

Chapter 7 : Rent Textbooks | Cheap Textbook Rental Source | blog.quintoapp.com

Description Charles Bennett's new Optics text offers modern topic coverage, emphasis and pedagogy. Bennett's clear writing style and vast knowledge of the subject matter brings a fresh voice to Optics courses.

Chapter 8 : Principles of Physical Optics | Optics & Photonics | Physics & Astronomy | Subjects | Wiley

PRINCIPLES OF PHYSICAL OPTICS C. A. Bennett University of North Carolina At Asheville WILEY-INTERSCIENCE A JOHN WILEY & SONS, INC., PUBLICATION.

Chapter 9 : Principles of physical optics (Book,) [blog.quintoapp.com]

Read "The Principles of Physical Optics" by Ernst Mach with Rakuten Kobo. The famous physicist explains the experimental and theoretical evolution in the understanding of light phenomena and app.